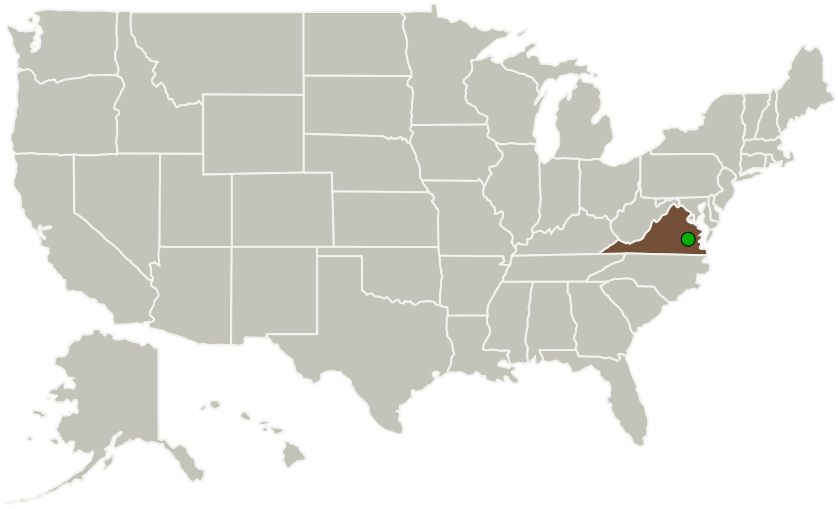
An Automated Energy Management and Crew Alerting System for Upset Prevention, Phase I

Completed Technology Project (2012 - 2012)

Project Introduction

Loss-Of-Control-In-flight (LOC-I) has been a longstanding contributor to fatal aircraft accidents. However, recent high-profile incidents, including Colgan Air Flight 3407 and Air France Flight 447, have underscored the importance of mitigating the LOC-I risk. In both of these incidents, it is clear that improper energy management was one of the precipitating factors that led to eventual loss of controlled flight. In order to reduce the potentially devastating effects of a mismanaged energy condition, Barron Associates has teamed with SA technologies to design and demonstrate an energy state protection system. The system pairs Barron Associates' proven optimization and control technologies with SA Technologies' situation-awareness-driven interfaces. Although built upon innovative ideas and algorithms, the proposed system focuses on the cardinal duty of "aviate" through pilot interaction and automated energy management. The energy state protection system: (1) models the dynamic evolution of the energy state and the energy requirements of the aircraft with flight phase, (2) determines an effective allocation of available flight controls to correct an off-nominal energy state and maintain safe operating margin, and (3) ensures that the crew is brought back into the "aviate" loop through effective alerting thus minimizing adverse pilot interactions with the automated components. Pilot-in-the-loop simulator testing will be used to demonstrate the benefits of energy state protection system and will pave the way for limited-envelop flight testing in Phase II and expanded-envelop flight testing in Phase III.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Barron Associates, Inc.	Lead Organization	Industry	Charlottesville, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137999)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Barron Associates, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

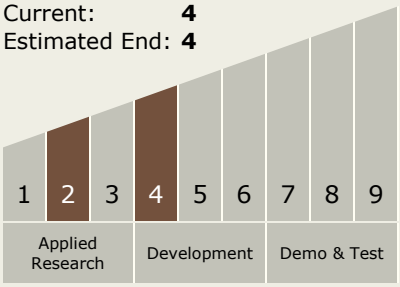
Carlos Torrez

Principal Investigator:

Richard Adams

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX16 Air Traffic Management and Range Tracking Systems
  - TX16.3 Traffic Management Concepts

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System